

## **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 25-44 and 46-50 are in the case.

### **I. THE ANTICIPATION REJECTIONS**

Claims 25-26, 43-44, 46 and 50 are rejected under 35 U.S.C. §102(b) as allegedly anticipated by Muskett (US 6,255,527). Claims 25-26, 43-44 and 46 are rejected under 35 U.S.C. §102(b) as allegedly anticipated by Watson *et al.* (US 5,831,120) (Watson). The rejections are respectfully traversed.

The present invention provides a process for the production of acetic acid. The process comprises reacting with carbon monoxide, methanol or a reactive derivative thereof in a liquid reaction composition comprising methyl acetate, a finite concentration of water, acetic acid and a catalyst system. The catalyst system requires an iridium carbonylation catalyst, methyl iodide co-catalyst, and at least one non-hydrohalogenoic acid promoter in an amount sufficient to provide a promotional effect on the carbonylation rate.

Claim 1 thus requires a non-hydrohalogenoic acid **promoter**, i.e., the non-hydrohalogenoic acid must be capable of **promoting the iridium catalyst**. As presently amended, the claim requires the at least one non-hydrohalogenoic acid promoter to be present in an amount sufficient to provide a promotional effect on the carbonylation rate. Thus, it is essential to the claimed invention that the non-hydrohalogenoic acid promoter actually **promotes the carbonylation rate**.

Muskett describes a method of controlling the carbon monoxide flow to a reactor in a methanol carbonylation process for the production of acetic acid, in which the liquid reaction composition in the reactor comprises methyl acetate, a finite concentration of water, methyl iodide, a Group VIII noble metal catalyst, which may be iridium, and optionally at least one promoter, which may be one or more of osmium, rhenium, ruthenium, cadmium, mercury, zinc, gallium, indium and tungsten.

The Action takes the position that the carboxylic acid product present in the liquid reaction composition of Muskett is an oxoacid promoter. However, the carboxylic acid has no effect on the carbonylation rate. The carboxylic acid is merely the product of the carbonylation reaction. The carboxylic acid does **not** promote the iridium catalyst.

Muskett does **not** disclose the presence of a non-hydrohalogenoic acid promoter in an amount sufficient to provide a promotional effect on the carbonylation rate, as now claimed. Muskett, therefore, does not anticipate the presently claimed invention.

Watson relates to a process for the production of acetic acid by the carbonylation of methanol wherein the liquid reaction composition comprises a Group VIII carbonylation catalyst, which may be iridium, methyl iodide co-catalyst, optionally at least one promoter, which may be selected from the group consisting of ruthenium, osmium, cadmium, rhenium, zinc, mercury, gallium, indium and tungsten, at least a finite concentration of water, methyl acetate and acetic acid product.

The Action takes the position that the propionic by-product formed in the process of Watson is an oxoacid. However, the propionic acid has no effect on the carbonylation rate. It is merely a by-product of the carbonylation reaction. The propionic acid does **not** promote the iridium catalyst. Watson does **not** disclose the

presence of a non-hydrohalogenoic acid promoter in an amount sufficient to provide a promotional effect on the carbonylation rate. Watson, therefore, does not anticipate the claimed invention. Withdrawal of the anticipation rejections based on Musket and Watson is respectfully requested.

## **II. THE OBVIOUSNESS REJECTIONS**

Claims 27-37 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over either Muskett or Watson in view of Vanderpool *et al.* (US 4,629,809) (Vanderpool). Claims 38-42 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over either Muskett or Watson in view of Tokumoto *et al.* (US 5,166,419) (Tokumoto). Claims 47-49 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Muskett. Claim 47 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Watson. The rejections are respectfully traversed.

The claimed invention provides a process for producing acetic acid by reacting methanol or a reactive derivative thereof with carbon monoxide in a liquid reaction composition comprising methyl acetate, a finite concentration of water, acetic acid and a catalyst system. The catalyst system requires an iridium carbonylation catalyst, methyl iodide co-catalyst, and at least one non-hydrohalogenoic acid promoter in an amount sufficient to provide a promotional effect on the carbonylation rate.

A problem addressed by the present invention is the need for an improved rate of carbonylation in an iridium-catalyzed, methyl iodide co-catalyzed carbonylation process for the production of acetic acid (specification, page 2, lines 3-5). The claimed invention

solves this problem by using, in the catalyst system, a non-hydrohalogenoic acid in an amount sufficient to provide a promotional effect on the carbonylation rate.

It is known that in the iridium-catalyzed carbonylation of methanol, hydroiodic acid is generated and, as the concentration of hydroiodic acid is increased, the rate of carbonylation is found to decrease. It is surprising, therefore, that the concentration of protons ( $H^+$  in the carbonylation system) can be increased without having a detrimental effect on the carbonylation rate (specification, page 2, lines 6-13).

Muskett and Watson relate to the use of "conventional" iridium catalyst metal promoters such as ruthenium, osmium and rhenium. Neither Muskett nor Watson suggests the use of non-hydrohalogenoic acids as iridium catalyst promoters.

Referring to the data presented in the present specification, comparing, for example, the results of Experiments 5 and C, in Experiment C, a ruthenium promoter was used but no non-hydrohalogenoic acid promoter. In Experiment 5, both ruthenium and a non-hydrohalogenoic acid promoter were used.

The results of this experiment and other experiments in Tables 1 to 5 of the specification demonstrate that improved carbonylation rates are achieved when a non-hydrohalogenoic acid promoter is used in an amount sufficient to provide a promotional effect on the carbonylation rate compared to the rates obtained by the use of an iridium catalyst in the presence or absence of a conventional metal promoter. Such improved rates could not have been predicted from Muskett and/or Watson.

The secondary art to Vanderpool and Tokumoto does not cure the deficiencies of Muskett and Watson. Vanderpool describes a process for producing acetic acid by reacting methanol with carbon monoxide in the presence of an iodine-free catalyst

system, wherein the catalyst consists of ruthenium compound, quaternary phosphonium salt, cobalt-compound, an inorganic acid or an organic acid, reacted in combination in a liquid form or a catalyst of ruthenium on an inert solid support with a sulfur-containing acid promoter.

Vanderpool does not relate to an iridium-catalyzed methanol carbonylation process. Further, Vanderpool discloses that the use of iodides is disadvantageous (col. 3, lines 6-18). Thus, one of ordinary skill in the art would not have been motivated to rely on Vanderpool and would have been lead **away** from the present invention which requires the presence of a methyl-iodide co-catalyst. In other words, when looking to improve the rate of carbonylation in an iridium catalyzed, methyl iodide co-catalyzed carbonylation process for the production of acetic acid, the person of ordinary skill, as of the filing date of the present case, would have had no incentive to consult Vanderpool since it leads away from the use of methyl iodide. One of ordinary skill would, therefore, not have been motivated to combine Muskett, Watson and Vanderpool in the context of the present invention.

Tokumoto relates to a method for preparing a-(4-isobutylphenyl)propionic acid. There is no suggestion in Tokumoto of a methanol/reactive derivative thereof carbonylation process. Tokumoto is not concerned with the production acetic acid. Thus, when looking to improve the rate of carbonylation in an iridium catalyzed, carbonylation process for the production of acetic acid, one of ordinary skill would not have been motivated to consult Tokumoto, since Tokumoto relates to a completely different reaction.

Based on the above, it is clear that one of ordinary skill would not have been motivated to arrive at the claimed invention based Muskett and Watson, taken singly or in combination, with or without Vanderpool and/or Tokumoto. Withdrawal of the obviousness rejections is respectfully requested.

**III. AMENDMENT**

Claim 1 has been amended to state "in an amount sufficient to provide a promotional effect on the carbonylation rate" after "nonhydrohalogenoic acid promoter". Support appears at page 5, lines 14-16 of the application as filed. No new matter is entered.

Favorable action is awaited.

Respectfully submitted,

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